

Double-charge exchanges for double beta decays

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The reach of neutrinoless double-beta ($0\nu\beta\beta$) decay searches that aim to observe lepton number violation and show that neutrinos are Majorana particles, depends on the nuclear matrix elements that govern the decay. The calculated nuclear matrix elements, however, suffer from several limitations. Predicted matrix-element values depend on the many-body method used to obtain them and, in addition, they may need to be “quenched”, albeit by an unknown amount. These uncertainties are hard to figure out from theoretical calculations alone because of the unique character of $0\nu\beta\beta$ decay, not clearly related to other nuclear structure observables.

In this presentation I will note the relation between the $0\nu\beta\beta$ decay, and double Gamow-Teller (DGT) transitions that can in principle be measured in double charge-exchange reactions. Shell model calculations in a very wide range of nuclei, covering from Ca-48 to Xe-136, suggest a linear correlation between $0\nu\beta\beta$ decay and DGT transitions. Furthermore, the correlation is in agreement with results from energy-density functional theory. These findings open the door to informing the value of $0\nu\beta\beta$ decay nuclear matrix elements in nuclear structure experiments.

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